Purcell Enhanced and Inhibited Emission in 3D Photonic Crystals

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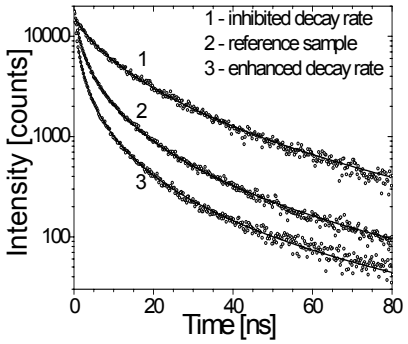
Control over spontaneous emission of light is essential to quantum optics and to diverse applications such as miniature lasers, LEDs, and single-photon sources for quantum information. We present experiments on emission from CdSe quantum dots (QDs) in 3D inverse opals. In time-resolved experiments, we observe that the photonic crystals control the emission decay rate of the QDs, demonstrating both broadband inhibition and enhancement [1]. For the first time we successfully interpret the emission dynamics of an *ensemble* of emitters (see Fig.): decay curves are modelled with a distribution of decay rates (curves). From this analysis we conclude that individual QDs experience even larger decay-rate modifications than the ensemble average.



[1] *Nature* **430**, 654 (2004); arxiv.org/physics/0410056.